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THE VULNERABILITY OF THE SOVIET BLOC TO A COMPLETE
EMBARGO ON EXPORTS FROM THE NATO COUNTRIES AND JAPAN

CIA/RR EP 62-13

March 1962

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THE VULNERABILITY OF THE SOVIET BLOC TO A COMPLETE
EMBARGO ON EXPORTS FROM THE NATO COUNTRIES AND JAPAN

I. Introduction

This study is designed to analyze the economic impact on various Soviet Bloc* countries of a complete embargo on exports to the Soviet Bloc from the NATO countries plus Japan.** Two studies of partial embargo have been included, one of an embargo against East Germany alone and one of an embargo against the USSR alone. These studies have been included because of the likelihood that the spur to action may develop from Berlin and also because an embargo against East Germany alone is the most effective among the various possible cases of geographically partial embargo that could be applied against the Soviet Bloc. Thus, the limited and transient impact of an embargo against East Germany alone underlines the futility of partial embargo in achieving much more than the political impact which would derive from a demonstration of the ability of the principal Western Allies to act in concert. We do not discount the political and psychological effect of embargo. Indeed, the political and psychological impact of embargo may be considerably greater than the economic impact.*** Thus, if limited political impact is sought, a partial embargo might be employed in spite of the very small economic impact it would produce.

An embargo against one country is of limited value simply because of the ease of evasion and the multiplicity of possible

* USSR, Czechoslovakia, Poland, East Germany, Hungary, Rumania, Bulgaria and Albania.

** For purposes of this paper references to NATO countries include Japan unless otherwise specified.

*** SNIE 2-2-61, Soviet and Other Reactions to Possible US Courses of Action with Respect to Berlin, 11 July 1961, TS, Limited.

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techniques of circumvention. An embargo limited by application to a single Bloc country is nullified by the only slightly more costly expedient of changing the consignee of the shipment who made the purchase from the West and diverting the shipment in transit or upon arrival in the nation to which it was consigned from the West. The commodity composition of present exports from the West to the Soviet Bloc is such that there would be no other useful and enforceable means of detecting their destination than by noting the nation which places the order. It would perhaps be possible to achieve some economic impact from a partial embargo if the NATO powers were to agree to maintain their exports to other Communist countries at a level no higher than the average of recent years.

The ease with which a partial embargo can be circumvented was amply apparent in the conduct of Sino-Soviet Bloc trade with the West between 1954 and 1958 when a differential existed between the severity of trade controls applied to Communist China and those applied to the Soviet Bloc. We of course cannot assure that an inversion of this process may not take place should the West embargo exports to the Soviet Bloc while placing no additional limitation on shipments to Communist China. Sino-Soviet relations in recent months have been sufficiently uneasy, however, to create a likelihood that the embargo would not be circumvented in this manner without some distinct advantage to the Communist Chinese from the transaction.

A partial embargo restricted in terms of its commodity coverage probably would be easier to police than a partial embargo limited to selected Bloc countries and would be less subject to circumvention. The embargoed nations can, of course, shift resources including research and development efforts to offset the loss. The shifts, however, are at the expense of some other activity. The loss cannot be completely offset by domestic rearrangements. If the items involved are already straining both productive and developmental capacity, for example, rolled steel products, then considerable difficulties and delays would result from the embargo.

A complete embargo under the most comprehensive control has a limited impact upon a diversified modern economy. This is amply

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clear in the findings that follow. The most pervasive influence of an embargo is neither wholly economic nor wholly political and psychological. Although the economic adjustments which an embargo would require of the Soviet Bloc would be manageable, this is not to say that the Soviet leadership would view such an embargo as merely a minor irritant. The Soviet leadership has faced increasingly difficult decisions in the allocation of resources among major claimants -- military, industrial, agricultural, consumer, foreign aid. Indeed, some degree of conflict among the claimants may recently have developed. Thus, should an embargo require a review of decisions already taken on resource allocation, it would reopen old conflicts and, at the least, would aggravate already vexing political and economic problems.

An important economic consequence of a general embargo which is often overlooked is its impact upon the Soviet estimate of the West's intentions. The USSR has been confident that the economic benefit to individual businessmen from Soviet trade would preclude the possibility of concert of action among the major Western powers. The record of action in the West under COCOM and CHINCOM has repeatedly verified the Soviet estimate. The Soviets view the Capitalist West as incapable of concerted economic action which might significantly reduce the income of the Capitalist Class. The USSR tends to discount the use of economic sanction by the West in any situation short of the exercise of force on a wide scale. Thus, even though there has been some contingency planning in the Bloc, Western application of a general embargo under any other circumstance would probably catch Bloc leaders without a satisfactory economic solution. Urgent action would therefore be required to minimize the short-run effect of the embargo. Simultaneously it might convey the prospect of a greater general threat to Bloc security than the USSR now believes it faces from the West.

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II. Conclusions

The Soviet Bloc today represents a largely self-sufficient economic entity possessing a vast and diverse natural resources base, a well developed and rapidly growing industrial plant, and an increasingly skilled labor force. Pursuant to official policy -- and aided in part by the impact of past Western trade embargoes -- the countries of the Soviet Bloc have consistently followed a course designed to achieve maximum economic independence from the West. The long-term economic plans of the Soviet Bloc countries rely for the bulk of their import requirements -- approximately for two-thirds of the total -- on intrabloc trade. Nevertheless, trade with the NATO countries, currently accounting for fifteen to twenty percent of total imports, continues to be of considerable importance to the Bloc, and especially to the European Satellites, as a supplement to domestic production and as a means of obviating extensive domestic effort on research and development.

At the outset it should be stated that the effect of a NATO embargo, either partial or complete would not -- over a 2-5 year period -- significantly reduce the Bloc's rate of economic growth. Moreover, an embargo would of itself produce no diminution in the production of military hardware and supporting equipment. Soviet priority accorded to this area is well known. An embargo, could, nevertheless, impose significant and continuing costs on the Bloc economies. These costs, while small relative to total Bloc capabilities, are large in absolute terms, and can not be ignored by Bloc leadership. In this sense an embargo is useful as one in an armory of weapons of retaliation or threat of retaliation.

In mid-1961, it was estimated* that the economic loss which the NATO countries could impose on the entire Sino-Soviet Bloc through embargo would amount to about \$4 billion or about two months growth. It was pointed out then that the European Bloc would bear the major part of the loss, that in the European Bloc some redirection of investment activity would be expected in order

* CIA, EP 61-47, July 1961.

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to compensate for the loss of capital goods imports from NATO countries. The eventual effect of these adjustments to an embargo would probably be concentrated on Bloc consumer goods industries as resources were diverted to maintain military programs and perhaps to supply the material requirements of the European Satellites.

The vulnerability of the Soviet Bloc economy to a NATO embargo in the early months of 1962 differs from that of mid-1961 in that (1) deliveries of Western machinery and equipment have increased in volume, (2) in the case of East Germany detailed plans have been constructed for coping with the contingency of a Western embargo action, and (3) there are some evidences of imbalances within the USSR economy today which were not present 6 months ago. The fact of an increased rate of deliveries of Western machinery and equipment, which tends to raise the degree of vulnerability, is counterbalanced by the existence of contingency plans which, in enabling the Bloc to react more quickly to an embargo once imposed, tends to decrease the level of its vulnerability. These two developments, therefore, tend to neutralize each other in effect, leaving unchanged the overall degree of Bloc vulnerability to NATO embargo action.

The evidences of economic strain within the USSR which have appeared within the past month or two are difficult to evaluate. The failure of non-agricultural investment to rise in 1961 over the level of the previous years (the annual increase in 1961 was 2.5 percent, compared with a 1960 increase of 9 percent and a 1959 increase of 14 percent) suggests that resources are strained. The most impressive evidence of internal imbalances lies in the fact that in 1961 residential construction failed to rise above the 1960 level, while non-residential construction increased about five percent. At the same time investment in machinery and equipment rose by perhaps eight percent. Because the Communist economies operate with minimal inventories, their characteristic tautness is often the source of imbalances. Shortages are a familiar fact of life in Communist countries, however, and techniques for coping with them are highly developed; despite the shortages Gross National Product increased in 1961 by perhaps as much as five percent.

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Whether an embargo levied at a time of internal economic strain would impose a larger aggregate economic loss than the same embargo imposed at another time, depends on the existing degree of internal dislocations. If an economy were already under severe strain, the additional stress imposed by an embargo might well be sufficient to cause a complete reappraisal of economic plans and reallocation of resources, where neither internal strain nor embargo by itself would have had such an effect. In this case the loss imposed by the embargo is multiplied. On the other hand if the internal strain is of minor degree and confined to only a few economic sectors, its existence is then irrelevant to the magnitude of the embargo's impact. While it is clear that the Soviet economy is facing increasingly difficult problems in the allocation of resources and is generally under greater strains than in recent years too little unfortunately is known at the moment regarding its state to determine which case best describes reality. Two additional thoughts, however, may be helpful.

In the very short run, imbalances take the form of exhausted inventories and therefore of delays in production in the consuming industries. An embargo would at least add to the number of existing shortages, and might increase the intensity of those already in existence if it shut off a flow of goods whose inventories were already exhausted. In the latter case, the immediate impact of the embargo would be multiplied by the lack of inventories, the delays in production would be longer, the repercussions through dependent industries more extensive and thus the immediate disruption greater. Similarly, in the intermediate term when imbalances take the form of a lack of excess capacity and therefore inelastic supplies, an embargo would either add to the list of goods already in inelastic supply or would intensify the degree of unsatisfied demand already in existence with further repercussions throughout the economy. In either case, since Soviet imports from NATO represent a wide range of industrial goods, it seems probable that both the immediate impact and intermediate-term effects of the embargo would fall on sectors already suffering shortages and would thus be subject to multiplication.

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A long-term aspect of the economic stress presently being experienced in the USSR is also relevant. Recent performance of the Soviet economy suggests that it is becoming increasingly difficult to maintain over-all growth rates at the high levels of the mid- and late 1950's. The sources of rapid growth of the early 1950's -- the rebuilding of war-devastated industries and the expansion of basic industries, including the plowing of new land -- have been largely exhausted. The extensive margin of growth has been reached and further sources of growth must be sought at the intensive margin -- in adapting more sophisticated technology, in developing a diversity of specialized goods, in rationalizing production and especially administration. Under the Soviet system the difficulty of such a rationalization implies a growing premium on the gains from foreign trade. Imports of precision, specialized items embodying new technology in many diverse fields, act to husband not only scarce research resources, but even scarcer entrepreneurial and administrative resources. Concern with economic efficiency through the whole range of output is leading to an increased awareness of relative costs, not only among industries internally, but as between a Soviet and foreign industry. Thus it seems likely that the pressure to maintain rapid growth rates will make the Soviet Bloc countries increasingly concerned with international trade in the long-run, although the greatest proportion of their trade will undoubtedly continue to be with one another.

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III. Gross Measures of the Impact on the Soviet Bloc of
a Complete Embargo Imposed by NATO Countries

The denial of all goods and services produced in NATO countries to members of the Soviet Bloc would, under generous assumptions of impact, cause a retardation in economic growth in Communist Europe of \$3 to $3\frac{1}{2}$ billion on an annual basis. This loss would be the equivalent of 2 to 3 months' increment to output, and would be borne primarily by the European Satellites. The estimated cost of such an embargo to the USSR is less than \$1.5 billion or roughly one month's growth; that to the other countries of Eastern Europe less than \$2 billion or about 6 months' growth. The loss would be felt most keenly in the months immediately following the embargo. Because of the importance of NATO suppliers to Bloc investment plans a denial of industrial machinery and equipment would result in a slightly reduced long-run rate of economic growth, although the loss in succeeding years would rapidly decline.

Recognizing the alternatives to imports from NATO open to the Soviet Bloc, the actual loss experienced in the first year following the imposition of an embargo might be considerably smaller than the 2 to 3 months growth estimated above. In fact, it has not been possible to identify any single item imported from NATO which is truly a "bottleneck" - i.e. - for which there is no possible substitute. Other than investment goods, whose acquisition obviates considerable research and development effort and therefore facilitates expansion of output, the only goods imported from NATO for which the available alternatives are substitutes of considerable inferiority are the special steels. Because these advanced steel items, primarily rolled or specially alloyed forms, are already in somewhat short supply within the Soviet Bloc, their output could not be expanded to compensate fully for the loss of imports from NATO. Nonetheless, substitution of other forms of steel for the loss of special steels is technologically possible, and in many instances, use of the inferior substitutes has only very recently been abandoned by the Bloc. The shift to the less desirable input could thus be accomplished with little ado. The result would be a product of lower quality -- a pump, for example, whose useful life would be diminished from 3 to 2 years.

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In the weeks immediately following the imposition of an embargo, the degree of disruption which the Bloc economies would experience would depend primarily on the level of their inventories of imported materials. With sufficient reserves to tide them over the period of adjustment to substitutes, the degree of disruption, and therefore the size of the immediate impact would be negligible: the burden of the embargo would fall entirely on growth rates. If inventories are not sufficient to satisfy requirements during the shift to substitutes -- and it seems likely that this would be true in a number of industrial sectors especially in the European Satellites -- the immediate impact of the embargo could be of significant magnitude. Because of the possibilities for substitution, however, the major part of the economic cost resulting from an embargo would probably not occur immediately but rather during the first year after the embargo.

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IV. Specific Vulnerabilities of the Soviet Bloc to a NATO Embargo

The Soviet Bloc has achieved a high degree of economic self-sufficiency and is able to meet most of its requirements for raw materials, machinery, and equipment from indigenous production. As a result, the imposition of an embargo by NATO countries could not be expected to have more than a marginal impact on overall economic growth within the Bloc, although the denial of certain imports -- specifically equipment and technology for the chemical and metallurgical industries as well as high-grade rolled steel products -- would cause temporary disruptions and production shortfalls in selected Bloc programs. Lacking the flexibility afforded by a well diversified industrial structure and generally more dependent upon foreign trade, the European Satellite countries -- East Germany in particular -- would feel the impact of such an embargo more acutely than the USSR, although the extent of this impact would depend on Soviet capability and willingness to allocate scarce resources on the basis of Bloc-wide, rather than internal Soviet, priorities.

In 1961, Soviet Bloc imports from the NATO area are estimated to have increased about 45 percent over those of 1959, to a level of approximately \$2,400 million. The NATO countries thus accounted for 16 percent of total Soviet Bloc imports, which are estimated to have been approximately \$14,400 million. Although detailed commodity statistics are not as yet available for all of 1961, it appears that, following the trend established in previous years, more than half of total Soviet Bloc imports from the NATO group consisted of machinery and equipment and iron and steel products.

The impact of an embargo by NATO countries would necessarily fall unevenly on the individual countries of the Soviet Bloc and upon the individual sectors of their respective economies. The following sections will discuss the extent of this impact on the major areas of the Soviet and Satellite economies.

A. Machinery and Equipment - General

The NATO countries currently supply approximately 15 - 20 percent of total Soviet Bloc imports of machinery and equipment, and about 70 percent of imports from non-Bloc sources. In 1961,

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these imports are estimated to have been valued at between \$4,000 million and \$4,500 million, with NATO countries supplying more than \$600 million. Though not large in terms of aggregate Soviet Bloc imports of machinery and equipment, deliveries from NATO countries are of some importance -- perhaps generally more qualitative than quantitative -- to several Bloc-wide priority development programs, especially those for the expansion and diversification of the chemical and petrochemical industries, the expansion of iron and steel industries, and the general program designed to raise labor productivity through increasing mechanization and automation of production processes throughout industry.

1. Chemical Equipment

Soviet Bloc programs for the priority expansion of the chemical and petrochemical industries -- especially for the manufacture of plastics and synthetic fibers -- appear to be dependent upon extensive imports from the West as domestic plant capacity and production technology are inadequate to supply the over-all quantities and product-mix of chemical equipment planned for installation. The USSR, which is the major producer of chemical equipment in the Bloc, has failed to meet its production goals for 1960 and 1961, and similar failures are indicated for East Germany, probably also for Czechoslovakia, and the other Bloc exporters of this equipment. Based on available information, some 7.5 to 15 percent by value of the equipment to be installed in Bloc chemical industries during the current Plan Period (1959-65) will be purchased from the Free World. More than 70 percent of total Soviet imports of chemical equipment during 1959-61 came from the NATO area. Indications are that Czechoslovakia and Poland, and to a lesser degree the other Satellites, will seek to purchase substantial quantities of chemical equipment in the West between now and 1965, and that the receipt of such equipment will have an important effect on their chemical programs.

Since Western countries other than NATO have little or no capability for the production of chemical equipment, an embargo levied by the NATO group would effectively deny essential chemical plant, equipment, and technology to the Bloc. This embargo would affect not only the growth of the chemical industry itself, but also other sectors of the Soviet Bloc economies which depend upon the raw materials and products from the chemical industries. Thus denial of synthetic ammonia plants would affect the planned output

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of ammonia which is geared to agricultural requirements for nitrogenous fertilizer. Denial of polyethylene and other plastics manufacturing plants would affect the goals for the production of plastics intended as replacement for certain metals and for the production of consumer goods. Denial of petrochemical plants would affect the Bloc's capability for developing a petrochemical industry and for using otherwise wasted by-products from petroleum refining in the manufacture of organic chemicals.

Chemical equipment imported from the NATO countries generally is highly instrumented, affording greater labor productivity, reduced costs, and increased quality in output. Moreover, it usually incorporates the latest available production technology and thus frequently serves as a prototype for domestic manufacture, providing substantial savings to the Bloc in terms of costs for research and development, and especially a saving in the time required to effect the transition from blueprint to full-scale production. In effect, Western chemical plant and equipment enables the Bloc to achieve its planned goals in a shorter period of time than would be possible if it were forced to rely on its own resources and technical skills.

2. Metallurgical Equipment

Soviet Bloc production of metallurgical equipment -- nearly 400,000 tons in 1960 -- meets the great bulk of the requirements of the USSR and the Satellite countries. The total volume of the imports of such equipment from the NATO countries in 1960 is not known, but it is not believed to have exceeded 10,000 tons. An embargo of metallurgical equipment to the Soviet Bloc by NATO probably would cause some delay and perhaps an underfulfillment of the 1965 production goals for special steels. Some of the European Satellites, particularly East Germany, Rumania, and Bulgaria, have indicated an increasing dependence on Western steel-finishing equipment to obtain the capacity planned for 1965. A denial of the equipment now on order or what is reportedly under negotiation with NATO countries would delay the time at which many types of finished steel now imported from NATO become available from domestic production.

To meet the growing requirements for metallurgical equipment, the Soviet Bloc plans considerable increases in production. By 1965 the USSR plans not only to increase the total production of

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this equipment by at least 50 percent over the 1960 level to over 300,000 tons, but to increase the proportion of rolling mill equipment to meet the most pressing needs for this equipment within the Bloc. Similarly, Czechoslovakia plans to double its 1960 production of metallurgical equipment to more than 180,000 tons in 1965 and further increases are scheduled in East German production as well.

Soviet production of metallurgical equipment in 1961 fell slightly below the 1960 level. Perhaps because of this, and because of the magnitude of demand for more advanced and instrumented rolling mill and finishing equipment and limited Bloc capabilities to step up production -- as distinct from increases of production in general purpose types of metallurgical equipment -- the USSR has apparently encouraged the Satellite countries to obtain such equipment from Western manufacturers.

3. Precision Instruments

The USSR, East Germany, Czechoslovakia and, to a lesser extent, Hungary have well-developed and diversified instrument industries which provide the overwhelming bulk of Bloc supplies. Although comprehensive information on Bloc instrument imports from the NATO area is lacking, they are believed to be small relative to domestic production in the Bloc. Exclusive of instruments already installed in complete plants or as instrumentation of other industrial equipment, Bloc instrument imports from all non-Bloc areas in 1960 amounted to an estimated \$35 million, reflecting a considerable increase over earlier levels.

The present low level of Bloc imports from the NATO countries -- the principal Free World producers of instrumentation -- is due in large part to the fact that the more advanced and sophisticated instruments remain under strict COCOM controls. The Bloc's imports have been highly selective, and have consisted of instruments which are either not produced in the Bloc at all or are more technologically advanced than those produced in the Bloc.

Current long-term Bloc plans (through 1965), calling for extensive mechanization and automation of production processes, have increased substantially the Bloc's requirements for precision instruments. Because Bloc production is not adequate to meet fully

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these growing requirements, it is expected that the Bloc, and especially the USSR, will increase considerably its purchases of certain Western instruments, automatic control systems in particular. However, because even the expanded level of future purchases will be only a small percentage of total Bloc supply, and since the more advanced types of equipment are in many cases already embargoed, a denial of all instrumentation equipment would have little effect on Soviet Bloc fulfillment of plans for mechanization and automation of industry, and would not exert a marked influence on overall goals. The effect would be felt primarily in a relatively small number of Bloc industrial installations and research facilities.

4. Other Machinery and Equipment

Soviet Bloc imports of machinery and equipment from NATO other than those already discussed, include food processing and refrigeration equipment, textile machinery designed especially for processing synthetic fibers, transportation equipment, and smaller quantities of power equipment, machine tools, ball bearings, and spare parts of all types. Generally speaking, these imports are small relative to Bloc production and production capacity, and the importance of advanced technology is not as crucial as is the case in other types of equipment. Food processing and refrigeration equipment, as well as textile machinery are largely consumer oriented. The Bloc has generally adequate production capacity to supply the bulk of this equipment as necessary, and can import such equipment from Western countries outside the NATO group. Imports of transportation equipment are primarily Soviet tanker purchases, estimated at 300,000-550,000 DWT through 1965. Although these imports represent a substantial portion of planned accessions to the Soviet tanker fleet during the Plan period, their purchase in the West appears to be more a matter of price and convenience to the USSR than lack of domestic building facilities. The impact of an embargo on the availability of transport facilities to the Bloc would be negligible on the assumption that the tanker fleets registered in other than NATO countries would be available to carry Soviet oil. Power equipment, metal-working machinery, and ball bearings make up a very small proportion of total imports of machinery and equipment from the NATO countries, and an even smaller part of domestic production within the Bloc. Here again Western countries other than those in the NATO group would probably be able to make up any shortfalls in imports resulting from an embargo.

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B. Ferrous Metals

Soviet Bloc consumption of rolled steel products (including pipes and tubes) in 1960 was approximately 73 million tons, of which less than 2.2 million tons, or about three percent of total Soviet Bloc consumption, were represented by imports from the NATO area. Imports into the USSR were 940,000 tons or 1.7 percent of Soviet consumption, and imports into the European Satellites were 1.2 million tons, or 7.1 percent of Satellite consumption. In addition, Sweden, Austria, and Yugoslavia provided 343,000 tons of rolled steel products, less than one half of one percent of total Bloc consumption. Because of the specialized types of steel imported, however, contributions by the West probably were more significant than their share in Bloc consumption suggests.

Although imports of rolled steel products from NATO countries thus represented only a minor portion of overall rolled steel consumption in the Soviet Bloc, their denial as the result of an embargo would tighten supplies of high quality steels, pipes, and tubes, but would not be a major or critical loss. Such an embargo would have a greater impact on the European Satellites, especially East Germany, than on the USSR.

Shipments by countries in the NATO group included principally hot and cold-rolled, flat-rolled products, pipes, and tubes, and to a lesser extent alloyed and cold-finished bars -- the types of rolled steel which have been somewhat in short supply throughout the Soviet Bloc. The Soviet Bloc countries exported a total of 338,000 tons of rolled steel products to the NATO area during 1960, but there is little substitutability between those products and the types imported.

An embargo would affect the USSR principally in supplies of 40" line pipe needed to complete the planned gas and oil pipelines on schedule. The loss of the considerable tonnage already contracted for and denial of further imports could delay not only the USSR pipeline program, but the conversion in the Bloc to use of more efficient fuels. To meet such a contingency, the USSR could substitute the smaller-sized pipe available within the Bloc, or intensify its efforts to step up production of the larger pipe. The USSR might also suffer from a cessation of NATO deliveries of

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cold-rolled sheets and strip, particularly electrical sheets, in which Soviet production technology has not caught up with the West.

An embargo of rolled steel products by NATO countries would have a more pronounced impact on the European Satellites, especially on East Germany, because of the larger share of consumption represented by imports from the West. Having only slightly more than a quarter of the USSR's production capacity for rolled steel, the European Satellites have less latitude to adjust their product-mix to provide for the loss of rolled steel products imported from the West. The extent of the impact of an embargo is influenced, however, by the extent of the adjustments in product-mix and allocations to consuming industries which the USSR would be capable and willing to make, and by the extent to which imports from countries outside the NATO group could be increased to make up for the shortfall. Excluding the possibility of transshipments from NATO countries, however, it appears that the other Western producers of rolled steel products -- primarily Austria and Sweden -- would have difficulty in replacing total Soviet Bloc losses of rolled steel caused by an embargo. In view of this fact, and considering the difficulties which the Soviet Bloc would face in expanding the production of specialized rolling mill and finishing equipment required to turn out the rolled steel products currently imported from the West, the embargo would continue beyond the period currently contemplated the tight supply within the Soviet Bloc of specialized rolled steel products.

C. Chemicals and Rubber

Chemical imports from NATO countries -- about \$190 million in 1960 -- probably did not supply more than 1 percent of aggregate Bloc chemicals consumption. The most severe impact on the Bloc's chemical and chemicals consuming industries would come not from an embargo by NATO countries on chemical exports, but rather from an embargo on chemical equipment (discussed in section IV A-1). It is estimated that the denial of chemical equipment which the USSR alone intends to purchase in NATO countries during 1962-65, (\$500-600 million) could cause a shortfall in Soviet chemicals production in 1965 amounting to \$1.7 billion, approximately 10 percent of output slated for that year. The impact would be greatest on output of basic petrochemicals and synthetic materials, although the effects elsewhere would also be significant: nitrogenous fertilizers and tires are two examples.

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The effects of an embargo on chemicals would be rather small, compared with likely impact of an embargo on chemical equipment. The Soviet chemical industry would be affected to a limited extent by the denial of certain chemicals, particularly intermediates for the production of plastics and tires, and of specialty items. A denial of chemicals from NATO countries would also have some disruptive effect on the European Satellites, but the general impact would be relatively mild. East Germany continues to depend on NATO deliveries for a small but vital selection of special chemicals. Czechoslovakia imports 95 percent of its supplies of styrene monomer -- required in plastics and synthetic rubber production -- from the United States. Some of the other Satellites obtain high-quality carbon black from NATO countries.

The Soviet Bloc also imports a relatively small quantity of synthetic rubber from NATO countries -- estimated at from 25,000 - 50,000 tons in 1961. The impact of a denial of this synthetic rubber is believed to be negligible, as there should be little problem in replacing most of these imports with natural rubber from Southwest Asia.

D. Fuels

The Soviet Bloc generally supplies all of its own fuel requirements, and its imports from NATO countries are restricted to high grade coking coal. This coal is required primarily by the East German and Polish iron and steel industries, although a decline in domestic production coupled with increased export commitments has recently forced Czechoslovakia, too, to make some purchases in the West. If these imports were denied, however, the USSR could provide the supplies of coking coal required, although initially there would be problems in adapting the lower quality (high sulphur content) Soviet coals to Eastern European operations. Selective blending of Eastern European coking coals with Soviet coking coals would be one method of reducing the deleterious effect of the lower quality of Soviet coals.

E. Agricultural Raw Materials and Foodstuffs

A NATO embargo would have little if any damaging effect on the Bloc's ability to obtain needed agricultural raw materials and foodstuffs. In fact, an unintentional effect of the embargo might well be an improvement in the consumer diet within the Bloc,

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since high-quality foodstuffs previously exported primarily to NATO countries would become available domestically. Most adversely affected by an embargo would presumably be Poland, which in recent years has obtained as much as one-half of total imports of wheat from the United States, as well as substantial quantities of cotton and some tobacco. The impact, however, would fall more heavily on Poland's balance of payments than on actual commodity supplies within the country, for United States exports move under the P.L. 480 program, which permits payment in Polish zlotys rather than foreign exchange. In place of imports of United States and Canadian wheat, Poland could draw in part on Soviet supplies, perhaps in exchange for Polish meat products previously exported to the West. This type of arrangement seems especially feasible in view of the fact that the USSR has recently placed substantial orders for meat products in France which would be cancelled under an embargo, and the further fact that the USSR exports some wheat to NATO countries which would also cease under an embargo. Shortfalls in Polish cotton supplies resulting from a denial of further exports from the United States could also be compensated by imports from the USSR or Egypt, although in either case the Poles would experience a foreign exchange cost.

F. Shipping

At present levels the seaborne foreign trade of the Soviet Bloc is about 87 million tons, of which Bloc ships carry an estimated 33 million tons. After the imposition of a NATO embargo this trade would decline to 51 million tons. In addition to its own lift capability the Soviet Bloc would have to acquire from non-NATO sources an estimated 2 million DWT of shipping to move 18 million tons of seaborne trade. This amount of shipping should be readily available from the 14 million DWT of shipping in those portions of the tramp fleets of Panama, Liberia, and Honduras which are not effectively controlled from the US, and the 7 million DWT of shipping in the freighter fleets of Sweden, Finland and Yugoslavia.

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V. Specific Vulnerabilities of the USSR to a NATO Embargo
Against (A) the Soviet Bloc and (B) the USSR Alone

A. An Embargo Against the Soviet Bloc

Because the Soviet Union is for all intents and purposes a self-sufficient economic unit, the general impact of a NATO embargo would be marginal. The acceleration of imports from these countries reflects the USSR's desire to "save time" in fulfilling its self-appointed task of overtaking and surpassing the US in per capita production and other economic indices. The impact of an embargo would be greatest on the development of the Soviet chemical industry and its pipe-line program and much less on other sectors. The most that could be achieved by an embargo would be a delay in the development of these sectors resulting in some minor retrenchments. The economic viability of the Soviet state would not be affected in any way.

Soviet imports from the NATO area, despite a rapid growth which led to a doubling of imports between 1958 and 1961, still account for only 17-18 percent of total Soviet imports. Imports from this area amounted to an estimated \$900 million in 1961, having grown at a faster rate than those from any other area. Pacing this increase in procurements from NATO have been machinery and equipment imports, which experienced a four-fold increase between 1958 and the present. Machinery and equipment plus steel and steel products make up the bulk of Soviet imports from the NATO countries.

1. Machinery and Equipment

Soviet imports of machinery and equipment in 1961 represented very nearly half of total estimated Soviet imports from NATO countries. Of total Soviet machinery and equipment imports, those originating from the NATO area accounted for about one-fifth of the total, the bulk of the remainder coming from the European Satellites. The importance of NATO machinery deliveries lies mainly with chemical equipment, electrical machinery, textile machinery, and a few other types, the major exporters of which are West Germany, France, the UK, Italy, the US, and Japan. The role of West Germany surpasses that of all other NATO members: Soviet

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machinery imports from West Germany amounted to almost \$100 million or almost one-third of the total in 1960. The importance of Italy, Japan, and the US in Soviet machinery imports is more recent.

a. Chemical Equipment

Soviet imports of chemical equipment totalled \$187 million in 1960, of which the NATO group supplied \$132 million, or more than 70 percent of the total. This represented an 8-fold increase over 1958.

The USSR places considerable emphasis on the growth and development of its chemical and petrochemical industries, but is having production difficulties in the manufacture of chemical equipment. The Soviet Union, which is the major Bloc producer of chemical equipment, did not meet its production goals in 1960 and 1961 and is placing considerable reliance on non-Bloc sources for chemical equipment, plant, and technology, particularly in the fields of petrochemicals and synthetics.

During the period 1958-1961 the USSR imported an estimated \$400 million of chemical equipment from NATO members. This quantity could support an investment program of roughly \$1.1 billion and about the same amount of new sales of chemicals and chemical products. In 1961 imports of chemical equipment from NATO were equivalent to 60-70 percent of total Soviet production and equipment. Soviet chemical equipment imports required from NATO during the period 1962-1965 are conservatively estimated at \$550 million. Denial of this volume might disrupt investments of 1.5 billion rubles in output of chemicals and a shortfall of 1.5 billion rubles could occur in 1965, or 10 percent of the goal for that year.* The impact would be greatest on the output of basic petrochemicals and synthetic materials although the effects elsewhere would be significant. The goals for synthetic ammonia production, for example, are linked with the growth of agriculture; the production of tire cord and rayon, with vehicles and cloth;

* It is currently estimated that a shortfall of at least 10 percent will occur without any embargo.

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plastics with the replacement of metals and for consumer goods; and petrochemicals to use wasted by-products in place of agricultural raw materials. Western chemical equipment and plants imported into the USSR generally involve chemical technology superior to that in the Bloc and the procurement of such technology allows the USSR to overcome this deficiency. Procurement from the West allows the USSR to use these imports as prototypes and to allocate its research and development resources to other high priority work. In effect, the purchase of this equipment is the purchase of time to permit a faster fulfillment of planned goals.

An important element in plans for the Soviet chemical industries is the automation of production, and generally those plants imported from the West are highly instrumented. The importation of such technology leads to considerable efficiencies in production, and the incorporated instruments ease the domestic shortage of process control instruments. In addition, equipment which is procured from NATO lightens the already heavy work-load of the Soviet machine-building industries.

It is doubtful that the USSR can meet its present goals for chemicals and chemical equipment output even in the absence of an embargo. The embargo would deter the growth and development of the chemical branches which are scheduled for large expansion as well as those economic sectors which depend on raw materials and products from the chemical industries.

The application of an embargo, however, would essentially entail delays in the programs for the chemical and dependent industries over the long term, and would compel Soviet leaders to reduce some of the more ambitious goals for the chemical industry. Inasmuch as this equipment would enhance the flexibility of the USSR's industrial establishment and would reduce production costs, its embargo would delay the diversification and ultimate independence of Soviet industry from outside assistance.

b. Metallurgical Equipment

The volume of metallurgical equipment imported by the USSR constitutes a small portion of production. In 1960, the USSR produced 218,000 tons of this equipment and imported about 24,000 tons, of which 23,000 tons represented rolling mill equipment. An

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embargo on the USSR would have little direct impact on the supply of Soviet metallurgical equipment inasmuch as the USSR obtains so little from the West. Czechoslovakia and East Germany, the chief suppliers, accounted for 21,000 tons of Soviet imports, while the chief NATO suppliers, West Germany and France, accounted for 1,500 tons and Austria 600 tons. Although there have been inquiries in France, West Germany, the UK, and Austria there is no evidence of Soviet purchases of the types of rolling facilities for which Soviet needs are greatest.

The USSR nevertheless remains burdened with the responsibility for producing for the entire Soviet Bloc most of the larger, complex mills such as those required in the production of flat rolled metals. There is evidence that the USSR is now hard-pressed to meet both export commitments and domestic requirements. Soviet production of sorely needed rolling mill equipment, as well as of the metallurgical equipment in general, in 1961 fell short of the 1960 level. In the case of rolling mill equipment, a vexing and persistent difficulty has been encountered in the coordination of designing, planning and production functions for the larger, multistand mills which may involve thousands of tons of equipment. Soviet production experience for these more advanced types of rolling and finishing equipment has been largely acquired only in the past 5 to 7 years, and while competence has been demonstrated in the manufacture of several continuous hot strip and sheet mills, significant progress in the production of continuous cold rolling mills and lines of pickling, annealing, and finishing of strip and sheet products has only recently been made. As a result, Soviet production lead times for the more sophisticated types of rolling mill and finishing equipment are usually four to five years and even longer, compared to about two years in the West.

c. Instruments

Soviet imports of precision instruments in 1960 amounted to \$36 million, an increase of \$11 million over 1955. Only one-fourth of these imports originated outside of the Bloc and about one-fifth was imported from the NATO area. By value, imports from NATO represent less than one percent of output. In addition, instruments were probably included in complete plants imported by the USSR.

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Imports consist of small numbers of high quality and technologically advanced instruments for laboratory use and for process control that are not produced in the USSR or in the Bloc or are of a higher technological level than those produced in the Bloc. These imports have included instruments for measuring high vacuums, viscous fuels, and corrosive media; continuous fluid stream analyzers, mass spectrometers, and electron microscopes.

It has been officially admitted that domestic output does not meet domestic requirements. Thus it has been stated that output of instruments and automation devices in 1958 satisfied only 60 percent of domestic requirements and for some items the percentage was considerably less. Despite progress since that time, requirements have expanded rapidly for mechanizing and automating industrial processes and the Soviet press has often complained of delays in commissioning plants because of lags in the delivery of instrumentation.

Soviet planned imports of instruments in 1965 are six times those of 1960. Because of the need for the more sophisticated instruments, particularly automatic control systems, a significant part of these imports is undoubtedly scheduled to come from the West. A NATO embargo would impede to a minor extent Soviet plans for mechanizing and automating industry and consequently would delay labor productivity increases. The effect, however, would be felt in a few industrial enterprises.

d. Other Machinery and Equipment

Plans for expanding the Soviet tanker fleet to carry its increasingly larger oil exports have resulted in a number of orders to Western shipyards for tankers to be delivered during the Seven-Year Plan period. It is estimated that 500,000-750,000 DWT of tankers will be delivered to the USSR from Free World countries by 1965. Large tankers -- up to about 50,000 DWT -- are being ordered from such countries as Italy and Japan, apparently for long-distance hauls. Smaller tankers are being ordered largely from non-NATO countries such as Finland, Sweden, and Yugoslavia, totaling less than 200,000 DWT. While the USSR has the capacity to build its own larger tankers, it has found it convenient to place these orders with Western shipyards. The impact of an embargo would be

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negligible on the assumption that present non-NATO tanker fleets are underemployed and will be available to carry Soviet petroleum to overseas customers.

The impact of a NATO embargo on other machinery categories would be considerably less than on such items as chemical equipment since many of these imports can be obtained from Western non-NATO countries such as Sweden, Finland, Austria, and Switzerland or because they are marginal in terms of basic Soviet priorities. Imports of textile and food processing machinery, for example, are consumer-oriented. Conventional machinery types as well as electrical machinery, metalworking machinery, and ball and roller bearings can be obtained from Sweden, Switzerland, Finland, and Austria, although these countries produce a narrower range of machinery types than do the larger NATO countries.

2. Ferrous Metals

The imposition of an embargo by NATO would tighten supplies of high-quality steels and pipe and tubes within the Bloc, but the impact upon the USSR would not be critical.

Shipments by NATO countries have been principally hot and cold flat-rolled products, pipes and tubes, and to a lesser extent alloyed and cold-finished bars, the types of rolled steel which have been in somewhat short supply within the Bloc. An embargo would affect the USSR principally in supplies of 40" line pipe needed to complete the planned gas and oil pipelines on schedule. Soviet requirements for 40" line pipe are estimated at 2.4 million tons during 1959-65 and Soviet production is not likely to exceed 900,000 tons. To date, about 490,000 tons have been imported and contracts for approximately 375,000 tons have been let. Sweden, a non-NATO supplier, is scheduled to supply 135,000 tons of 40" pipe over the next three years but it is doubtful that Sweden is capable of providing much more than this amount. The capabilities of Austria, Finland, and Switzerland are non-existent. The loss of the tonnage contracted for could delay the Soviet pipeline program; however, a reduction of the diameter of some of the lines to pipe sizes available within the Bloc is possible, and through an intensification of effort, Soviet domestic capacity for the production of large-diameter pipe could be increased faster than now contemplated.

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Since Soviet exports of petroleum to the NATO countries would be denied in the event of an embargo, it appears doubtful that there would be great pressure on the USSR to acquire pipe from any source for completion of those oil pipelines intended in large part to supplement export capability. Such lines include the branch of the USSR-European Satellite line which would link the Baltic and/or Black Sea ports into the system, the line from Stalin-grad designed to supply additional crude oil to Novorossiysk and Tuapse, and the Al'met'yevsk to Leningrad line. Consequently, production of oil and gas line pipe and auxiliary equipment (pumps, compressors, valves, fittings) would be concentrated on those sectors of line which would be given priority. An embargo would free other types of oil transportation equipment and it is possible that the urgency for constructing significant lengths of new oil pipeline systems to meet indigenous and Bloc needs would be substantially reduced.

Further impact on the USSR might be caused by the denial of cold-rolled sheets and strip, particularly electric sheets. The USSR lags behind the NATO countries in the technology and equipment for the production of such items and capacity for cold flat-rolled products is not being installed as quickly as planned. A shortage of cold-rolling capacity relative to ingot and semi-finished capacity is evidenced by the Soviet conversion (hire-rolling) deals recently made with Western European countries. The lack of access to Western supplies of these items would not constitute a critical loss to the USSR. The measure of the impact of an embargo on the USSR would be affected, however, by the degree to which the Soviet leadership would deprive domestic industry in order to meet priority requirements of the Satellites, and by the extent to which losses from NATO could be replaced by imports from non-NATO countries, particularly Austria and Sweden. These two countries and Yugoslavia may be able to increase exports of rolled steel, but not in the amounts necessary to offset the loss of NATO deliveries.

3. Other Commodities

a. Chemicals

Soviet imports of chemicals, including chemical products, pesticides, dyes, and pharmaceuticals, from NATO countries

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amounted to about \$30 million in 1960 or about one-fifth of the total imported from all sources.

While the impact of an embargo on chemicals as a whole would be negligible, the cessation in the supply of certain chemicals from these countries, particularly intermediates for the production of plastics and tires (e.g., carbon black and tire cord) and of specialty items such as ion-exchange resins would have a somewhat greater impact on the Soviet chemical industry. Spot shortages of critical chemicals have occurred and are likely to occur in the future, particularly in the event of an embargo, since the industry is being expanded on a forced-draft basis. Nevertheless, the impact of a chemicals embargo on the overall development of the Soviet chemical industry would be no more than a negligible deterrent to the rate of growth.

b. Rubber

One of the key problems in the Soviet rubber industry is the development of a synthetic polyisoprene rubber to replace natural rubber. Because of difficulties, the USSR has been forced to continue importing natural rubber from the Free World; 200,000 tons annually during the period 1958-1960 and about 350,000 tons in 1961. Most of this rubber originates in Malaya. All Soviet synthetic rubber imports from outside the Bloc in 1960 came from Italy (10,000 tons) and Canada (1,300 tons). Some of these imports could be replaced by industrial non-NATO countries, but until the USSR achieves more significant successes in the production of suitable synthetic rubber, it will have to rely heavily on natural rubber imports.

c. Copper

While Soviet purchases of copper in the Free World have remained steady at 100,000 tons annually for more than five years, the USSR has gradually shifted its buying from the UK and the Low Countries to primary producers, such as Rhodesia and Uganda. Imports supplement an estimated production of 425,000 tons (1960) and Soviet exports (exclusively to its European Satellites) of 64,000 tons in 1960.

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In the event of an embargo, the USSR could shift its buying further to these and other countries, such as Chile, which produces about 500,000 tons annually, Sweden, Finland, and possibly Mexico, Peru, and South Africa.

B. An Embargo Against the USSR Alone

The USSR would sustain little direct economic effect from the imposition of an embargo against it which did not include the East European Satellites. Soviet imports of materials and manufactured goods would move freely to the several European Satellite countries (documented as East European imports of course) and there be forwarded to the USSR. Soviet imports of machinery and equipment from the embargo area would be more difficult. Imports of items which are stock items at the producer establishment would move in the fashion outlined above. Imports of complete facilities which incorporate substantial expenditures for engineering, design, and production technique would be substantially reduced. In some cases the USSR might order the equipment through East Europe and supply the engineering and related expenditures itself. In other cases it might forego the import all together. The total imports foregone in the event of selective embargo would not exceed 50 percent of Soviet machinery and equipment imports from NATO and would probably amount to less than \$100 million annually.

The effectiveness of a selective embargo of this type could be strengthened somewhat if it were accompanied by an agreement among the NATO countries to limit exports to other Communist countries to the average level of some recent period. An agreement of this sort could be partially offset by Soviet Bloc pooling of orders and priorities, but such action would throw the cost of Soviet evasion upon the European Satellites. Such a condition might lead to considerable Soviet restraint upon the use of Satellite buying power and thus impose the principal incidence of the embargo on the USSR.

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VI. Specific Vulnerabilities of East Germany to a NATO Embargo Against A) the Soviet Bloc, and B) East Germany Alone

A. An Embargo Against the Soviet Bloc

A number of measures taken by the East German regime since mid-1961 apparently has been successful in reducing East Germany's short-run vulnerability to NATO sanctions against the Bloc. As a result of improved contingency planning and, in particular, a substantial increase in inventories of scarce high-quality steels, the authorities have decreased considerably both the impact and duration of the period of initial economic disruption which would follow a NATO embargo. The dependence of East Germany on NATO for imports of critical materials, however, will not significantly decline before 1963. Quality steel, metallurgical equipment, and a small number of essential chemical products imported from NATO countries would not be obtainable elsewhere or could be acquired only after a considerable lapse of time. In the one or two areas where East German planners have reduced the economy's long-run dependence on NATO supplies, the reduction has resulted either from expanded domestic production capacity, as in the case of certain chemicals, or from a specific commitment by a Bloc country to replace NATO suppliers, as in the case of certain alloy steels and pipe.

In planning against the short-run impact of an embargo, the East German government instructed individual plant managers to prepare plans against the eventualities of both West Germany and NATO-wide sanctions in 1962. Of much greater importance, however, was the sharp rise in East German imports of steel from West Germany in the second half of 1961, resulting in a doubling of such deliveries for the year over those of 1960, and a rise in East German steel inventories. Steel deliveries from the NATO areas as a whole increased from 359,000 tons in 1960 to an estimated 550,000 tons in 1961, of which 440,000 tons originated in West Germany, and NATO's share in total East German steel supplies rose from 9 percent in 1960 to 12 percent in 1961. The increase in steel inventories, mainly in the last quarter, may have been 200,000 tons or more. Because this increase was associated with the rise in NATO deliveries in the latter part of the year, it is likely that much of it was in

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the form of higher grade steels imported from the West. Although the perennial decline in GDR first-quarter imports from West Germany may have resulted in some drawing down of these inventories during the early months of 1962, stocks are still substantially above those of early 1961 and may be expected to increase again as interzonal trade picks up during the second half of the year.

In the event of a NATO embargo, inventories of quality steels would be drawn down in order to maintain limited deliveries to priority consumers while alternate sources of supply were being developed and internal readjustments being made in the East German economy. The short-run impact on East Germany is thus considerably less than that estimated a year ago.* The longer-term problem of getting along without these high-quality steels remains a substantial one. A significant part of this gap could be met from the increased steel capacity of other Bloc countries, particularly the USSR. The extent to which this might occur would depend on the willingness of the USSR to adjust its product-mix to accommodate East German needs and on the Bloc-wide priority assigned to East Germany's steel requirements. In fact, the current GDR program to convert from the German DIN to the Soviet GOST industrial standards suggests a move to facilitate the substitution of additional Soviet special steels into the East German production complex. Such adjustments would be costly to make and their achievement would take considerable time, even after Soviet authorities had decided how and to what extent the burden would be laid on the Soviet economy.

The program to reduce and ultimately eliminate East German dependence on NATO countries, particularly West Germany, for steel products is basically a plan to expand East Germany's domestic rolling mill capacity. An important part of this increased capacity is to be supplied by West Germany, with a lesser part to be provided by other NATO countries. The East German regime has planned approximately a dozen major installations for which it has ordered West German equipment, including cold rolling mills, tube and wire rod mills, and specialized finishing equipment. Tube mills and tube

* EIC-R18, Vulnerability of the East German Economy to Western Countermeasures, December 1960, SECRET.

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drawing facilities, with an annual capacity of 60,000 tons also have been ordered from a French consortium, which is to make its initial deliveries in 1962. A NATO embargo against the Soviet Bloc would have considerable impact on these plans. No more than insignificant quantities of such equipment could be obtained from non-NATO countries in the West. A decision to produce the equipment in the Bloc would result in substantial delays, particularly for specialized finishing equipment.

Since 1960 East Germany has managed to reduce greatly its former dependence on West German chemical products. This has been achieved largely by shifting to Bloc sources of supply and by increasing its own production of many products. To a lesser extent it reflects a shift to other suppliers within the NATO area. There remains, however, a small residual of vital products which the East German authorities have as yet been unable to shift away from NATO sources. Included in this hard core, the importance of which is much greater than its relatively small volume of imports would suggest, are rubber chemicals, certain plastics, and a small number of special purpose chemicals. Although a NATO embargo now would have considerably less impact on GDR chemical-consuming industries than in the past, the denial of this small group of chemicals, all of which are scarce within the Bloc, would necessitate costly adjustments in the consuming industries, unless a decision were made to spread the shortage over a larger number of Bloc countries.

In other products the impact of a NATO embargo would be insignificant. The coking coal supplies now acquired from the USA and West Germany could be obtained from the Soviet Union, although the shift to the lower-quality Soviet product, or its mixture with higher-quality coking coals, would be initially costly. Requirements for NATO-supplied precision instruments, which complement the incomplete range of such equipment produced by East Germany, would be difficult to transfer to Bloc suppliers because of a Bloc-wide shortage of these products. Current levels of GDR instrument imports from NATO amount to \$8 million. East German exports of certain electronics equipment, particularly television receivers, would be affected by a stoppage of NATO supplies. The greatest loss would be the picture tubes currently purchased from West Germany.

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B. An Embargo Against East Germany Alone

East Germany's vulnerability to a NATO embargo has been substantially reduced since mid-1961, mainly for the reasons given in Part A, above. By establishing comprehensive contingency plans against such an embargo, and by increasing inventories of high-grade steel imported chiefly from West Germany, the regime has diminished both the duration and the intensity of the initial economic impact of NATO sanctions. East Germany's few critical requirements for selected NATO products would be satisfied primarily through purchases on the GDR's behalf by other Bloc countries -- the rapidity of their response depending on the thoroughness of Bloc planning against such a contingency -- and to a lesser extent by deliveries out of Bloc production. For these same reasons the long-run effects, too, of such a partial embargo would be insignificant.

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WEST GERMAN EXPORTS TO SOVIET ZONE OF GERMANY

Value and Percent of Total NATO (Including Japan) Exports to Soviet Zone of Germany, 1959-61

	Value - Millions of US \$									
	1959				1960				1961 1/	
	January-June		July-December		January-June		July-December		Value	Percent
	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent
Total	134.6	<u>75.5</u>	122.2	<u>73.2</u>	108.4	<u>66.2</u>	120.1	<u>66.1</u>	114.1	<u>64.9</u>
Food, Beverages and Tobacco and Fats and Oils	14.7	40.8	13.3	41.0	11.3	37.9	14.3	45.1		
Crude Materials	5.8	50.4	5.2	44.1	5.5	39.9	3.9	51.3		
Mineral Fuels, Lubricants and Related Materials	15.3	90.3	13.9	100.0	6.8	100.0	1.6	80.0		
Chemicals	15.2	81.7	13.9	83.7	14.7	76.2	14.2	80.2		
Manufactured Goods	59.7	85.7	54.2	80.8	47.4	72.4	53.7	67.0		
(Of which Iron and Steel)	(<u>40.4</u>)	(<u>90.8</u>)	(<u>36.6</u>)	(<u>83.8</u>)	(<u>29.5</u>)	(<u>74.9</u>)	(<u>33.6</u>)	(<u>67.6</u>)		
Machinery and Transport Equipment	23.1	92.4	21.1	85.8	20.7	86.6	29.5	88.1		
Other Merchandise and Miscellaneous Transactions	0.8	40.0	0.6	100.0	2.0	42.6	2.9	32.2		

1/ Commodity data for 1961 are not available.

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Soviet Bloc Consumption and Imports of Rolled Steel
(000 MT)

	Consumption		Imports from the West			
	1959	1960	Total 1959	1960	NATO and Japan 1959	1960
Soviet Bloc	65,940	72,645	1,997	2,516	1,645	2,173
of Which						
USSR	50,767	55,300	848	1,093	678	940
(Including Pipe and Tube)			(261)	(305)	(236)	(301)
European Satellites	15,173	17,345	1,149	1,423	967	1,233

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NATO (Including Japan) Exports to European Satellites and Soviet Zone of Germany, 1959-61

Value - Millions of US \$

	1959							
	January-June				July-December			
	EurSat		East Germany		EurSat		East Germany	
	Value	Percent	Value	Percent	Value	Percent	Value	Percent
Total	514.7	100.0	178.2	100.0	565.3	100.0	167.0	100.0
Food, Beverages and Tobacco and Fats and Oils	97.4	18.9	36.0	20.2	100.7	17.8	32.4	19.4
Crude Materials	65.8	12.8	11.5	6.5	68.1	12.0	11.8	7.0
Mineral Fuels, Lubricants and Related Materials	15.9	3.1	15.4	8.6	14.2	2.5	13.9	8.3
Chemicals	60.0	11.7	18.6	10.4	59.8	10.6	16.6	9.9
Manufactured Goods	170.1	33.0	69.7	39.1	189.3	33.5	67.1	40.2
(of which Iron and Steel)	(92.3)	17.9	(44.5)	25.0	(97.6)	17.3	(43.7)	26.2
Machinery and Transport Equipment	96.5	18.7	25.0	14.0	129.6	22.9	24.6	14.7
Other Merchandise and Miscellaneous Transactions	9.0	1.7	2.1	1.2	3.6	0.6	0.6	0.4

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NOTE: Data may not add to totals because of rounding.

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NATO (Including Japan) Exports to European Satellites and Soviet Zone of Germany, 1959-61
(Continued)

	Value - Millions of US \$									
	1960								1961	
	January-June				July-December				January-June	
	EurSat Value	Percent	East Germany Value	Percent	EurSat Value	Percent	East Germany Value	Percent	EurSat Value	E.Ger. Value
Total	592.5	100.0	163.8	100.0	660.8	100.0	181.7	100.0	682.8	175.7
Food, Beverages and Tobacco and Fats and Oils	124.2	21.0	29.8	18.2	133.7	20.2	31.7	17.4		
Crude Materials	67.4	11.4	13.8	8.4	72.1	10.9	7.6	4.2		
Mineral Fuels, Lubricants and Related Materials	8.4	1.4	6.8	4.2	3.1	0.5	2.0	1.1		
Chemicals	64.6	10.9	19.3	11.8	60.0	9.1	17.7	9.7		
Manufactured Goods (of which Iron and Steel)	208.6 (119.8)	35.2 20.2	65.5 (39.4)	40.0 24.0	238.7 (139.1)	36.1 21.1	80.1 (49.7)	44.1 27.4		
Machinery and Transport Equipment	111.6	18.8	23.9	14.6	137.0	20.7	33.5	18.4		
Other Merchandise and Miscellaneous Transactions	7.7	1.3	4.7	2.9	16.1	2.4	9.0	5.0		

NOTE: Data may not add to totals because of rounding. 35 -

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NATO (Including Japan) Exports to the European Bloc and USSR, 1959-61

Value - Millions of US \$

	1959							
	January-June				July-December			
	European Bloc		USSR		European Bloc		USSR	
	Value	Percent	Value	Percent	Value	Percent	Value	Percent
Total	685.3	100.0	170.6	100.0	841.7	100.0	276.4	100.0
Food, Beverages and Tobacco, Fats and Oils	127.1	18.5	29.7	17.4	122.9	14.6	22.2	8.0
Crude Materials	83.4	12.2	17.6	10.3	94.4	11.2	26.3	9.5
Mineral Fuels, Lubricants and Related Materials	15.9	2.3	--	--	14.2	1.7	--	--
Chemicals	69.1	10.1	9.1	5.3	73.5	8.7	13.7	5.0
Manufactured Goods	240.0	35.0	69.9	41.0	303.5	36.1	114.2	41.3
(of which Iron and Steel)	(125.5)	18.3	(33.2)	19.5	(181.3)	21.5	(83.7)	30.3
Machinery and Transport Equipment	139.3	20.3	42.8	25.1	226.9	27.0	97.3	35.2
Other Merchandise and Miscellaneous Transactions	10.5	1.5	1.5	0.9	6.3	0.7	2.7	1.0

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NATO (Including Japan) Exports to European Bloc and USSR, 1959-61
(Continued)

	Value - Millions of US\$										
	1960								1961 1/		
	January-June				July-December				January-June		
	European Bloc		USSR		European Bloc		USSR		European Bloc		USSR
	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value
Total	930.9	100.0	338.4	100.0	1054.8	100.0	394.0	100.0	1094.3	100.0	411.5
Food, Beverages and Tobacco, Fats and Oils	154.2	16.6	30.0	8.9	150.5	14.3	16.8	4.3	182.2	16.6	
Crude Materials	94.9	10.2	27.5	8.1	118.5	11.2	46.4	11.8	141.9	13.0	
Mineral Fuels, Lubricants and Related Materials	8.4	0.9	--	--	3.2	0.3	0.1	Neg.	4.5	0.4	
Chemicals	89.4	9.6	24.8	7.3	81.6	7.7	21.6	5.5	96.1	8.8	
Manufactured Goods	344.1	37.0	135.5	40.0	396.6	37.6	157.9	40.1	363.7	33.2	
(of which Iron and Steel)	(223.6)	24.0	(103.8)	30.7	(251.2)	23.8	(112.1)	28.5	(235.3)	21.5	
Machinery and Transport Equipment	230.4	24.8	118.8	35.1	286.4	27.2	149.4	37.9	282.1	25.8	
Other Merchandise and Miscellaneous Transactions	9.5	1.0	1.8	0.5	18.0	1.7	1.9	0.5	23.8	2.2	

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NATO (Including Japan) Exports to European Bloc and USSR, 1959-61
(Continued)

NOTE: Figures may not add to totals because of rounding.

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1/ Commodity distribution was estimated from January-March data which were not available for USSR.

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APPENDIX *to CIA/RR EP 62-13*

Methodological Note on Estimate of Total Impact

Conceptually, there are available several techniques for measuring the result on the output of an economic entity of a change in the rate of flow of inputs. Considerations of feasibility limited the actual measure of the economic cost used in this paper to two techniques. One measures, under certain assumptions, the multiplied effects of the loss of certain bottleneck-type inputs; the second is based on the average incremental capital-output ratio for the economy as a whole.

(1) Effect of Loss of "Bottleneck" Inputs

This measure is based mainly on a calculation of losses in the industries where one imported commodity -- steel -- is a primary input, to which was added an extremely rough allowance for other losses.

The predominant importance of steel in the short-run is due to the fact that all Soviet Bloc countries are net importers of steel from NATO, especially of the higher quality and more processed types of rolled steel; to the lack of substantial excess capacity for producing these steels in the bloc; and to the limited short-term substitutability of other materials for steel.

To estimate the loss resulting from the denial of steel imports the following assumptions were made:

(a) The Soviet Bloc would be unable to replace the value of net imports of iron and steel formerly obtained in NATO countries -- some \$400 million in 1960 -- for a year following an embargo. In other words Bloc supplies in terms of value would fall by the amount of these net imports.

(b) Around two thirds of the shortfall in steel supplies (\$267 million) would be borne by the metal-processing industries, the other third affecting mainly construction.

(c) Within the metal-processing industries no other materials could be substituted for steel, but adjustments in product assortment and mix of steel inputs would permit all available steel to be utilized.

On the basis of input-output relationships in the US, Italy and Poland, it was estimated that about \$5 worth of machinery or other

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metal products can be produced with each dollar of steel input. Using a multiplier of 5 the loss of \$267 million of steel input would result in a loss of about \$1.3 billion of machinery and metal products.

Because of greater substitutability among construction materials the multiplier for steel used in construction should certainly be smaller than 5. A multiplier of 2 was judged a reasonable order of magnitude, giving an additional loss of some \$300 million, and a total loss attributed to steel of about \$1.6 billion.

Roughly \$500 million of Soviet Bloc imports from NATO consist of industrial materials and semi-manufactures (excluding iron and steel). Denial of some of these, particularly chemicals, might create bottlenecks in certain industries. On the other hand imports of textiles and other materials for light industry undergo relatively little processing and little economic activity depends on them. A multiplier of 3 applied to total imports of industrial materials and semi-manufactured other than steel would give a loss of \$1.5 billion. The total loss in production resulting from the disruption in the supply of materials and intermediate products would then amount to some \$3.1 billion.

The remainder of Bloc imports from NATO -- some \$1.0 billion, consists of finished goods, (including machinery) the denial of which directly affects domestic availabilities and investments but has very little short-term impact on output. Thus we obtain losses of slightly over \$4 billion without taking any account of the new domestic uses found for the former exports to NATO. Close to \$0.5 billion would have to be deducted on account of food alone, since former food exports to NATO would certainly find ready domestic buyers, and there would be some uses for most former exports of chemicals, nonferrous metals, machinery and manufactured consumer goods, if not for most of the coal, petroleum and wood in the short-run.

The estimate of a loss of \$3.5 billion during the year following an embargo is much more likely to be too high than too low for various reasons indicated above. It is probably more representative of the yearly rate of loss for the 6 months or so following the embargo than of the actual loss for the year.

In the short-run the European Satellites would probably bear the bulk of the loss, because they are more dependent than the USSR on imports from NATO, particularly imports of steel. Losses in the Satellites would probably run about double those in the USSR for a time. The eventual distribution of losses, however, would depend on Soviet policy.

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(2) Capital-Output Ratios

Let Y = GNP, ΔY = annual investment in GNP, I = annual investment; then

	(1)	(2)	(3)	(4)
	Y	$\frac{\Delta Y}{Y}$	$\frac{I}{Y}$	$\frac{(3)}{(2)}$
USSR	\$200 billion	6%	27%	4.6
European Satellites	75 billion	5%	30%	6.0

Thus in the USSR, on the assumption that annual imports of \$300 million of machinery and equipment could not be replaced, that machinery accounts for 40% of the cost of capital investment and that no adjustment of domestic investment is made to compensate for its loss, annual output would fail to rise by roughly \$150 million. Assuming a ten year life, the aggregate long-term cost of the embargo would amount to \$1.5 billion. It is also assumed that the loss of other imports from NATO would be counter-balanced by the availability of Bloc goods that would otherwise have been exported to NATO; thus it is assumed that the entire cost of the embargo is represented in the output denied through the embargo of machinery and equipment.

Similar assumptions are the basis for estimating that the loss of \$250-300 million of European Satellite imports of machinery and equipment from NATO countries would result in a lost increment to output of \$1.0 to 1.5 billion.

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Approved For Release 2005/05/16 : CIA-RDP79T01049A002400080001-6

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Approved For Release 2005/05/16 : CIA-RDP79T01049A002400080001-6